INTRODUCTORY IGNEOUS AND METAMORPHIC PETROLOGY GEOL 308–Spring 2022

Syllabus for Lecture and Lab

Lecture room: Exploratory Hall L505
Instructor: G. Mattietti, PhD
Lecture time: MW, 1:30-2:45 PM - Lab time: M 3 – 5:45 PM
E-mail: gkysar@gmu.edu
Office Hours: Wednesday 11 AM to 1 PM, or by appointment
Instructional Material: John D. Winter, principles of igneous and metamorphic petrology
Available from the bookstore or from:
https://www.pearson.com/us/higher-education/program/Winter-Principles-of-Igneous-and- Metamorphic-Petrology-2nd-Edition/PGM146492.html
Used textbook and/or sharing the textbook is fine. Make sure you are buying the book by Winter, there are Petrology textbook with the same title but by other authors.
Handouts and other materials distributed through Blackboard

Course Objectives and Goals

This is a junior-level igneous and metamorphic petrology course designed to give students the knowledge and skills for identifying, classifying and interpreting igneous and metamorphic rocks in their tectonics context. By the end of this course, students who applied themselves to the study of Petrology should be able to:

- To identify and classify igneous and metamorphic rocks samples in macroscopic, microscopic and through geochemistry
- To relate the rocks to the geologic, tectonic and structural framework
- To understand the general reactions that take place in the rocks, and place these reactions in a PTX context
- Use databases to collect and interpret analytical data in their tectonic context.

Course Prerequisites

This is an upper level geology class for geology and chemistry, chemical engineering majors. The topics discussed in this class require a basic solid knowledge of mineralogy and chemistry. The class covers a significant amount of material so you should not assume that topics will be reviewed starting at the basic level. A grade of C or higher in mineralogy is required before taking this class.

Course requirements and grading

While attendance is not mandatory, the course is intensive and missing class may result in falling behind with academic work. Students taking this course should have already completed introductory level geology course, chemistry and mineralogy. Course Assessment is based on the results of Three 3 lecture exams laboratory exercises and one laboratory project. Each assessment component is worth as follows:
3 lecture exams, each worth 25% of the course for a total of 75% of the final grade.
Lab portion: 25% of the course, this includes exercises contributing to 8% of the final grade (exercises assessment based on timely submission and completion) and a chemical petrology project, worth 9% of the final grade and two lab exams worth 8% of the final grade.
Laboratory exercises consists of a variety of practical experiences, and collaboration is encouraged, but submissions is individual for each lab. Details of the laboratory assignments and the project are posted at the time of each lab, along with a template for the workbook and scoring rubrics.

Final grade is assigned based on the following scale, with no exceptions:
A+≥ 99%, 95 ≥ A <99%, 90 ≥ A – < 95%; 85≥ B+ <90%; 80≥ B <85%; 77≥ B- <79%; 73≥ C+ <77%; 70 ≥ C <73%; 65≥ C- <70%; 50≥ D <65%; F<50%

- No lowest exam score is dropped.
- No final curve, unless the end-of-semester final average for the whole class (based on all lecture exams and lab scores) falls below 80%
- Absence/fail to submit an exam will result in a 0 (zero) score for that exam. No make-ups granted unless extenuating circumstances occur. Make ups carry a 10% penalty.
- No Extra-credit available. During lecture, there will be opportunities to collect additional points by working at active and collaborative learning activities. These points will be added to your exams and will be the sole opportunities for additional course points, provided they are completed during class time. Extra-credit based on individualized assignment is not available under any circumstance.

Laboratory

This course has an associated laboratory that consists of a series of exercises, lab exams and a final project. Each lab has specific requirements and deadlines. Late submission carry a penalty of 10% of the lab score per day of delay.

Course Policies

You are responsible for reading attentively this syllabus. By staying enrolled in this course, you agree to the following course policies:

- Attendance: not mandatory, but highly recommended if you want to do well.
- Communications: Email is the official way of communicating with students. Any email from me will come from gkysar@gmu.edu or through blackboard. In accordance with protection of privacy best practices, I will not respond to email sent from non-GMU email accounts. It is your responsibility to make sure that your GMU email is set up properly and to check your email regularly. Your email must have a subject line because emails without subject are filtered as spam mail.
- Class etiquette: All students in attendance have the right to a safe and quiet learning environment. Respect all rules and regulations established by GMU (see university policies below). Come to class on time and if you must leave earlier do so in a way that will not disturb the other people present in the room. During class, mute your cell phones. Class disruption of any sort will not be tolerated.
- Extenuating circumstances might occur that prevent you from taking an exam. If such circumstances can be justified, a make-up session with no penalty is available. Should you realize you cannot take an exam as scheduled, inform the professor immediately. As per GMU policy on religious festivities, you must inform the instructor at the beginning of the semester if you will be absent to an exam if order to schedule a make-up.
- Course materials: all course material (note, tests, outlines, slides, activities etc.) is protected by U.S. copyright law and/or is intellectual property of the course instructor; you cannot repost this material on the web, on online study sites or distribute in any other format outside the class.

University policies

As a GMU student enrolled in this class, you must be aware of the following:

- **Health and safety protocols** established by the University, go to this link and scroll to Health and Safety https://www.gmu.edu/safe-return-campus

- **Privacy** is covered by the Family Educational Rights and Privacy Act (FERPA) and is an essential aspect of this course. Students must use their GMU email account to receive important University information, including communications related to this class. In accordance with FERPA regulation, I will not respond to messages sent from or send messages to a non-GMU email address.

- **The Honor Code** is an integral part of the educational process, and GMU takes these matters very seriously. Violations of academic integrity occur when students fail to cite research sources properly, engage in unauthorized collaboration, falsify data, cheat during exams and in other ways outlined in the Honor Code. Students accused of academic integrity violations should contact the Office of Academic Integrity to learn more about their rights and options in the process. Outcomes can range from failure of assignment to expulsion from the University, including a transcript notation. The Office of Academic Integrity maintains a permanent record of the violation. For more information, please refer to the Office of Academic Integrity website.

- Be aware of the issues related to the use of study sites, refer to the instruction from the **Office of Academic Integrity** with important information about study sites. All students must watch this video: https://youtu.be/oKbTrgBCN7c

- **TITLE IX** As a faculty member, I am required to report all disclosures of sexual assault, interpersonal violence, and stalking to GMU-Title IX coordinator at https://diversity.gmu.edu/title-ix If you wish to speak with someone confidentially, contact the Title IX office athttps://diversity.gmu.edu/title-ix/who-can-i-call

- **Disability Services.** https://ds.gmu.edu/ Any student who may need an accommodation based on the potential impact of a disability should contact Disability Services ods@gmu.edu to establish eligibility and to coordinate reasonable accommodations. In order to receive accommodation for exams students must submit their DS paperwork before the exam.

- **Counseling and Psychological Services** https://caps.gmu.edu/ GMU offers counseling and psychological services, supporting mental health and personal development by collaborating directly with students to overcome challenges and difficulties that may interfere with academic, emotional, and personal success.

- **Diversity and Inclusion:** https://diversity.gmu.edu/diversity Faculty, staff and students in this course welcome and value individuals and their differences including race, economic status, gender expression and identity, sex, sexual orientation, ethnicity, national origin, first language, religion, age, and disability.

- **Observance of religious holidays**. In accordance with University policy, students should notify faculty during the first week of the semester of their intention to be absent from class on their day(s) of religious observance if that should coincide with an exam. For details and policy, see: https://ulife.gmu.edu/religious-holiday-calendar/

Course Calendar*

- This calendar displays dates of lectures only. See Academic Calendar for standard holidays.
- Notes and reading assignments for each lecture are posted on blackboard the day before class

Date	Lecture topic	Laboratory
Jan 24	Igneous structures and field relationships I	Lab 0 - What previous knowledge and skills do you need for this course
Jan 26	Igneous structures and field relationships II	
Jan 31	Igneous structures and field relationships III	Lab 1 – igneous rocks classification in hand sample
Feb 2	Modal and normative classification of Igneous rocks	
Feb 7	Phase diagrams	Lab 2: modal and normative classification
Feb 9	Phase diagrams - multiple components Major and trace element oxides petrology	
Feb 14	Trace elements and REE petrology	Lab 3: intrusive igneous rocks in thin section
Feb 16	Chemical petrology of isotopes	
Feb 21	Q&A for exam 1	Lab 4: volcanic igneous rocks in thin section
Feb 23	Exam 1 Lecture	
Feb 28	Origin of Magma	LAB 5 – Pyroclastic rocks in thin section.
March 2	Variety of Oceanic Basalts: Ridges and Rises	
March 7	Convergent plate boundary magmatism	Lab 1-5 wrap up- make ups in preparation for lab exam 1
Mar 9	Hot spot magmatism: oceanic	

Mar 21	Hot-spot related rocks mantle plumes CRB-Yellowstone	Exam 1 Lab
Mar 23	Continental magmatism: kimberlites - Carbonatites	
Mar 28	Granitoids	**Lab project** intro: IgPet software and databases
Mar 30	Layered Mafic intrusions	
Apr 4	Q&A for exam 2	Lab project continued
Apr 6	Lecture exam 2	
Apr 11	Metamorphic phase diagrams Thermobarometry	Lab 6 metamorphic rocks in hand sample Lab project continued
Apr 13	Metamorphism of mafic and ultramafic rocks	
Apr 18	Metamorphism of Pelitic Rocks	Lab 7: introductions to petrographic analysis of metamorphic rocks – Lab project: continued
Apr 20	Metamorphism of Carbonates	
Apr 25	The role of fluids, metasomatism	Lab 7 continued – Lab project: continued
Apr 27	Metamorphic Associations	
May 2	Mantle petrology	Lab project: due today Lab 7: due today
May 4	Q&A for exam 3	
May 11	**Exam 3: lecture and lab 1:30 to 4:15 PM**	

*Lecturer reserves the right to change lecture topics to fit class needs and learning objectives